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AUTHOR Freseman, Richard D.
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ABSTRACT

This document reports on a practicum experience on the improvement of thinking skills of middle school students. There has been much discussion in educational circles that mastery of higher- order thinking skills should be given greater attention in the public schools. A program of teaching thinking skills directly to grade seven geography classes was developed. The skills of organizing and summarizing, influencing through the use of analogies, and divergent thought using brainstorming techniques were taught in their own right and then applied to the content area of geography for enhancement. The project made use of newspaper articles to visualize and prioritize important facts and concepts, teacher-made analogies demonstrating a variety of relationships, and exercises that stressed divergent thinking as opposed to the traditional teaching method of convergence. The results of the practicum were generally positive. The students exhibited enthusiasm and interest in class discussions as well as involved parents at home. Evaluation instruments noted improvement in higher-order thinking ability as the project progressed, even though not every predicted percentage of success set by the practicum was met. A better understanding and appreciation for world geography was an added feature of this practicum. Five tables appear in this document, and there are 25 appendices. (Author/DB)

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P R A C T I C U M
REPORT

ED320842

Center for the
Advancement of Education
Ed.D. Program

Improving Higher-Order Thinking
Of Middle School Geography Students
By Teaching Skills Directly

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Improving Higher-Order Thinking
Of Middle School Geography Students
By Teaching Skills Directly

by

Richard D. Freseman

Cluster 25 B

A Practicum II Report Presented to the Ed.D. Program
In Early and Middle Childhood
In Partial Fulfillment of the Requirements
for the Degree of Doctor of Education

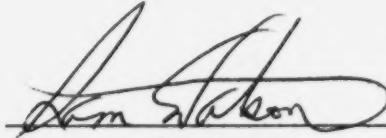
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1990

PRACTICUM APPROVAL SHEET

This practicum took place as described.

Verifier:

 (signature)

Sam Watson

Principal (title)

15245 Military Trail (address)

March 8, 1990

(date)

Jupiter, Florida 33458

This practicum report was submitted by Richard D. Freseman under the direction of the advisor listed below. It was submitted to the Ed. D. Program in Early and Middle Childhood and approved in partial fulfillment of the requirements for the degree of Doctor of Education at Nova University.

Approved:

March 12, 1990

Date of Final Approval of Report

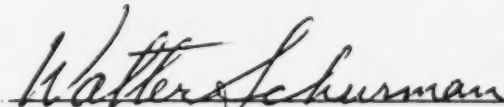

Walter Schurman, Ed. D., Advisor

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ABSTRACT

Improving Higher-Order Thinking of Middle School Students by Teaching Skills Directly. Freseman, Richard D., 1990: Practicum Report, Nova University, Ed.D. Program in Early and Middle Childhood. Descriptors: Critical Thinking/Inductive Thinking/Deductive Thinking/Problem Solving/Comprehension/Creative Thinking/Skills Instruction/Analyzing Skills/Decision Making/Classification Skills/Evaluating Skills

The purpose of this practicum was to improve the thinking skills of middle school students. There has been much discussion in educational circles that mastery of higher-order thinking skills should be given greater attention in the public schools.

The writer developed a program of teaching thinking skills directly in grade seven geography classes. The skills of organizing and summarizing, inferencing through the use of analogies, and divergent thought using brainstorming techniques were taught in their own right and then applied to the content area of geography for enhancement. The project made use of newspaper articles to visualize and prioritize important facts and concepts, teacher-made analogies demonstrating a variety of relationships, and exercises which stressed divergent thinking as opposed to the traditional teaching method of convergence.

The results of the practicum were generally positive. The students exhibited enthusiasm and interest in class discussions as well as involving parents at home. Evaluation instruments noted improvement in higher-order thinking ability as the project progressed, even though not every predicted percentage of success set by the writer was met. A better understanding and appreciation for world geography was an added feature of this practicum.

CHAPTER I

INTRODUCTION

Description of Community

The community was once a small, coastal town and is now bustling with construction activity. It is located in the northern part of a county and has experienced considerable growth for the past 15 years. In addition to growth coming from outside the state, there is a population movement from within the county from south to north as people leave the more crowded areas.

According to the 1980 census, the population was just under 10,000. This figure could easily be doubled by the next count. The outlying residential areas are in addition to this figure.

The construction boom is bringing a mixture of single-family homes, condominium complexes, and planned-unit-developments in the incorporated areas, and acre-plus sized lots in the unincorporated areas.

The income level of the community is rising due, in part, to the influx of professional people such as those who work at a nearby aircraft research and development company.

Writer's Work Setting and Role

The setting is a middle school located on the fringe of the community. The school is overcrowded, being designed for 1,150 students and currently enrolling 1,650. This is accomplished by using 32 portable classrooms. The school district plans to erect a second middle school to ease overcrowding and handle future growth. This will no doubt be at least two years into the future since land has not yet been acquired.

The land surrounding the school is being planned for residential development so the future looks bleak until another center is constructed.

The school was opened six years ago in a location away from populated areas. This fact necessitates the use of 28 buses to transport approximately 80% of the student body.

Good community support is accorded the school which is evidenced by parental involvement in academic projects, strong attendance at annual open-house gatherings, as well as enthusiastic support for extracurricular activities.

The writer is currently teaching social studies after 23 years experience in grades 4, 6, 7, 8, and 9. The entire time has been spent in the same school district. The first five years were in a junior high school teaching geography,

history, and civics. The next 12 years were in an elementary school which meant that appropriate certification had to be added through part-time course work in order to stay in field. The current assignment is middle school where grade six science and grade seven social studies have been taught.

The writer's educational experience began after an enlistment in the United States Navy. A bachelor's degree in United States history and a master's degree in the broad field of social studies were achieved. There is certification to teach social studies from grade seven through 12 in addition to elementary school through grade six.

The current responsibility of the writer is teaching geography to 142 grade seven students. The school policy is to ability-group for all academic subjects. The writer's assignment is four advanced classes and one regular. The same textbook is used for both levels as mandated by the district; however, there is a different set of objectives for each group. Two separate lessons plans are necessary even though at times a particular topic can be covered simultaneously.

The geography classroom is designed in an almost square shape with a counter across the back and an abundance of bookshelves above the counter. One side wall is bulletin

board from floor to ceiling while the opposing wall is brick. The front wall is brick with a chalkboard. The bulletin board wall is utilized for map display while the brick side wall presents problems for adequate display use.

The students have a six-period day with 50-minute periods. Teachers are responsible for teaching five periods and have one period for planning.

CHAPTER II

STUDY OF THE PROBLEM

Description of the Problem Situation

There is an ongoing discussion in educational circles about the importance of teaching thinking skills. Almost everyone in the field of education is of the opinion that mastery of higher-order thinking skills should be a priority in the public school system. A stumbling block to the inclusion of these skills into curricula at the local school level is that education in general, and educators in particular, tend to be conservative in philosophy and traditional in methods. Parents of school aged children fall into the same pattern of tradition when they show concern for good grades and the ability of their children to recite such things as a list of facts or locate the 50 states on a map.

Learning certain facts in a particular school subject, such as geography, is still a vital part of a child's education. It is when a teacher proceeds immediately to the next set of facts, without expanding on what has been learned or memorized, that a great disservice occurs. The children get caught up in the process when they receive good grades for memorization or for successfully locating

required answers in a textbook that are just waiting in the pages like grapes to be plucked.

The problem surfaces in social studies classes when teachers ask students to analyze a geographic concept, or to predict the outcome of a political confrontation, or to evaluate the results of a natural disaster. Too often the response is "I don't know" or "I don't understand." These may be the same students who have top scores and grades in that subject area. They have the ability to learn and understand higher-order thinking skills but due to various reasons they are not being taught how to think.

Part of the problem in the local school setting is how social studies must deal with the school district's list of educational objectives. For example, in grade seven geography there are 75 objectives which call for such things as defining, listing, demonstrating, interpreting, evaluating, discriminating, analyzing, describing, supporting, and contrasting various geographic facts and concepts. On the surface it would appear that Bloom's taxonomy of educational objectives is being addressed and that higher-order thinking is being required. Frustration sets in when a teacher attempts to cover the objectives and realizes that the students do not automatically think in terms of Bloom's descriptors. The

problem now becomes one of time. How can the students be taught higher-order thinking skills and at the same time satisfy the district mandated objectives in the span of a school year?

Briefly stated, the problem is that grade seven geography students are not being taught higher-order thinking skills due to the use of traditional teaching methods which emphasize the acquisition of knowledge.

Documentation of the Problem

In order to demonstrate that a problem exists, a survey was given to the 12 members of the social studies department at the writer's school (see Appendix A). All five questions related to the teaching of thinking skills. Of those who responded, the results showed that there was not enough time during the middle school years set aside for the teaching of thinking skills (see Appendix B). The majority of responses indicated that students would benefit from "how-to" instruction in thinking skills before application is made to the content area. There was also opinion that the school district's curriculum guide did not offer adequate help with the teaching of skills.

A short test was given to 99 students to measure their ability in analytical thinking (see Appendix C). The test

items were taken, with permission, from the Whimby Analytical Skills Inventory (see Appendix D). Students were asked to describe how they arrived at each answer and whether or not they guessed. The results showed that as the degree of difficulty increased, the students relied more on guesswork (see Appendix E).

The chief administrator of the middle school was interviewed informally on the subject of thinking skills as an educational priority (S. Watson, personal communication, October 19, 1988). It was his opinion that thinking skills should be taught in all academic subjects and that currently not enough is being done to foster higher-order thinking.

The advanced geography students involved in this practicum were given a set of five statements in an effort to ascertain their knowledge of certain words (see Appendix F). Each statement included a command-word intended to invoke a higher-order thinking process. The students were not required to deal with the statements, but only to indicate whether or not they understood the wording.

The results indicated that the terms "contrast" and "interpret" presented the students with the greatest uncertainty while "sequence" and "summarize" were the most familiar (see Appendix G).

A list of the five command words was then given to

the students as a vocabulary exercise (see Appendix H). These results showed that the term "sequence" was correctly identified by all students while "summarize" received the lowest number of correct responses (see Appendix I). It was learned from these two short exercises that there exists uncertainty as to the definition of some key command words.

There is a problem when students are expected to engage in higher-order thinking and they are confused about the terminology used in the instructions.

Causative Analysis

Educational experts have attempted for years to agree on the cause of poor student achievement in thinking skills. The blame has been placed on the schools in general and teachers in particular, textbook publishers, movies, television, and the home environment.

It is the opinion of the writer that the cause can partly be found in the expectations of parents, students, and teachers.

In the home, parents expect good grades from their children. They ask about report card grades and scores on tests and if they see good results they assume that learning is taking place. If they observe their children

studying for a test on the 50 states or memorizing the 50 capitals they are happy, especially when the grade on the subsequent test is high. The parents may recall their own school days when certain things were learned or memorized with perseverance and hard work. They expect the same from their children. This process is knowledge gathering and remembering. It is not considered to be higher-order thinking although knowledge is a vital part of the thinking process and remembering can give students the edge needed for greater success.

Part of the cause of poor achievement in thinking skills can be found with the expectations held by the student himself. He feels parental pressure for good grades and, in the case of the middle school student, has elementary school experience in how to achieve those good grades. In social studies class he is dealing with the tradition of "the answer can be found in the book." The student expects to receive a list of questions, page numbers from the book, and a due date. If all is done well, a good grade is issued. Parents are happy, the teacher is happy, and the student is happy. "I must be learning," is the thought of the student, when in fact what has been learned is how to look up answers that are, quite simply, waiting to be found. While this is an important skill, it is not considered to be higher-order thinking.

The final cause of the problem lies with the expectations of the teacher. Often teachers are steeped in the traditional teaching methods of their own former teachers. These methods often do not allow for the teaching of thinking skills. The methods are geared primarily for the transfer of knowledge and the expectations for success are centered around recall. Social studies teachers talk, students take notes and read assignments, and information is later recalled for testing purposes. The students with the best recall make the best grades while they may or may not have a command of thinking skills. Unfortunately, a teacher with an outstanding reputation for imparting knowledge may unknowingly be doing his students a disservice by not using the information base as a springboard into higher-order thinking.

Relationship of the Problem to the Literature

The teaching of thinking skills has been discussed by educators since the turn of the century as a goal for all areas of instruction. Few can agree on such important things as precisely which skills should be taught, how much time should be set aside for teaching skills, or even a definition of the term "thinking skills."

Beyer (1984) suggests that there are five steps that

educators can take to change this confusing and nonproductive situation. The steps are: identify a core of thinking skills to teach, identify the components of each skill, engage in precise classroom instruction in the skills, apply the skills to the content-area curriculum, and develop testing measures that are valid and reliable for the skills taught. He believes that Benjamin Bloom and his associates have developed an inventory of microthinking skills that all teachers should be teaching in their classrooms (Krathwohl, Bloom, and Masia, 1964). Beyer believes that, even though there may be gaps in Bloom's descriptions of precise operations, it would still serve as a common ground for basic thinking operations to be taught in the classroom.

In identifying the components of each skill, Beyer believes that teachers themselves need to be precise as they define skills to be taught or they cannot expect their students to be precise. He also suggests that teachers engage in the skills they are attempting to teach.

Providing appropriate instruction, according to Beyer, goes beyond the use of materials which generate answers to be graded as products of higher-order thinking. He stresses the point that teachers need to take a more direct role in the teaching of thinking skills. The students need to be consciously aware of what they are doing and

how to do it.

Beyer strongly suggests that thinking skills be taught in an organized and sequential manner across all subject areas. Until this is done he does not see any real progress in improving the learning of thinking skills in our schools.

The final point stressed by Beyer is that testing must match what has been taught. Teachers and test makers should use the same skills models but with different content or data in the test questions. If students are to be measured for higher-order thinking proficiency, they need to be given test items with unfamiliar information so that they can apply specific skills in the solving process.

Tanner (1986) sees the principal goal of education as the teaching of students to think critically. This is accomplished if a student is able to question, probe, analyze, explain, and evaluate. He believes that the quality of life is improved for everyone because error, injustice, and prejudice are more easily recognized for what they are. Tanner suggests that an assignment for critical thought should be one where students are required to deal with two persuasive but conflicting arguments. He believes that it is necessary for students to feel a bit unsettled and uncomfortable for critical thought to take place. Tanner would hope that students have such a strong encounter with criticism that they come

to realize that every critical statement is an opinion. He feels that learning this is important because students begin to realize that their opinions are worthy, they gain personal confidence to speak out on a topic, and there is no need for a feeling of conformity to a certain order.

Reading comprehension is a basic component of critical thinking. Wilson and Hammill (1982) believe, from their study, that inferencing may play an important part as comprehension links the new and known. The study asked a group of grade nine geography students to pause and paraphrase selected passages from their textbook as they read. The data showed a considerable difference among the four reader-ability groups. The higher level readers made many more inferences than did the lower groups. Since the lower groups did make some inferences, Wilson and Hammill believed that they were capable of inferencing. They further felt that because of a lack of background knowledge, the poorer readers were unable to make the inferences that were needed for good comprehension.

Developmentally, middle school children are in the process of moving from concrete operational thinking to full formal thinking. Decker and Silverman (1986) believe that in helping students to bridge the gap between the two operational levels, they can also be helped to become better critical thinkers. In the area of improving the

skill of inferencing, they suggest that the teacher should model his own thinking process for the students, being very explicit in how an inference is developed. The teacher must demonstrate how to raise questions about inferences and how to consider all possible answers.

Baldwin (1984) tells of a program in the Summitt, New Jersey, School System for training teachers how to systematically teach higher-order thinking skills through a special Thinking Strand. The program was first tried in social studies classes with the final plan calling for K-12 coverage. The concept is based on Bloom's taxonomy and has teachers actually going through the process from the knowledge level of thinking to the highest level, evaluation. The teachers design the curriculum by using the same higher-order thinking skills that they hope to teach to their students. Baldwin explains that in social studies, each grade level staff develops creative and critical thinking skills by using such things as debates, case studies, and problem solving activities that are content-related. Inductive and deductive reasoning skills, along with divergent thinking, study skills, and memorization are learned and practiced by the teachers. They become guides and resources in the program instead of merely passing on information.

Thinking before acting is something that parents

attempt to instill in their children from the earliest years. Nickerson (1984) believes that everyone knows how to think without being taught. He sees the problem as one of thinking consistently and of being aware of the importance of stopping to think before acting. He also believes that the motivation to think about a problem is present in students but not necessarily the ability to follow through to a solution. Even though there are a number of formal programs designed to teach thinking, Nickerson believes that there already exists, in place, various systems in the primary and secondary content curricula. Some of these are math to teach logical thinking, science to teach relationships and processes, reading and writing to enhance creativity. Many high school graduates are not properly prepared to do the kind of thinking required by college programs so Nickerson is in favor of a heuristic approach to problem solving which gives students a strategy to follow no matter what the problem may be. This he feels can be done in the classroom as part of the existing content program and does not need to be dealt with separately.

Zenke and Alexander (1984) tell of a program used in Tulsa, Oklahoma, schools which is designed to teach thinking. Called the "Think Program", it operates on the concept that there exists an analogy between a word and

an idea and it can be understood. Students can learn new words and principles after they see a resemblance between new and familiar words and ideas. The thinking process follows a structured pattern of: identification or naming something, qualifying or naming parts and characteristics, grouping things according to qualities, dividing something into component parts, sequencing, recognizing analogies. Zenke and Alexander see the ability to understand analogies as the heart of the analytical process.

There is so much information being generated today that people are unable to know all they need to know. Smith (1987) tells us that instead of spending time trying to learn only facts, students need to learn how to find information and then decide what is important. She goes on to say that teachers do their students a disservice if they only show them how to locate and retrieve. They must help to develop skills in questioning, analyzing, comparing, contrasting, and evaluating so that students will not become addicted to being told what to think and do.

Smith suggests the addition of nonprint media to thinking skills curriculum. She believes that audiovisual materials can be beneficial in four ways: the setting, group, and size can be varied; the teacher does not have to be constantly involved; some students need an occasional change from the teacher's voice for improved attention;

and added excitement can be given to the learning task. Smith encourages the use of slides to show students how to use visual clues, to pick important data from incidental observations, and to pick clues from background information. Discussion of slide scenes permits students to compare their observations and conclusions with others.

Another problem that Smith would have teachers address is that of helping students to avoid accepting the first idea or answer that is suggested. She feels that presenting alternatives can best be done through brainstorming.

The direct teaching of thinking as a skill is something that de Bono (1983) believes should be part of every educational program. There is not enough time to teach all the information that could be useful so some of the instructional time needs to be given over to the teaching of thinking skills. In de Bono's opinion, the approach to teaching thinking through the idea of processing is not the total answer. He suggests that the perceptual area needs to be developed so that children are able to see things differently and more clearly. He also suggests that the teaching of thinking skills have a set place in the curriculum of a school so that students, parents, and teachers all understand that skills are being taught directly. In his experience, de Bono has found that thinking is a skill at which children can improve and one

in which they can see value in putting forth effort.

How to fit the teaching of thinking skills into an already crowded curriculum is not a problem to be taken lightly. Bereiter (1984) tells us that there are two methods of teaching thinking skills that rarely succeed in longevity. They are making the skills an enrichment activity and treating them as subject matter. To guard against almost certain failure, he suggests thinking skills be made an integral part of existing instructional objectives and that entire instructional programs be saturated with thinking skills activities.

Bereiter believes that games are useful because they can be motivating, give immediate feedback, and can be adjusted easily for the intellectual level involved. A disadvantage can be the attitude of some who feel that games are nonessential activities. When games are used as spare time activities and as part of planned lessons where reinforcement is needed, even skeptical teachers will see the value of games. Too often, games are relegated to Friday afternoon treat status.

Two kinds of thinking operations are considered by Reeve, Palincsar, and Brown (1985) to be present in the minds of students as they function in the school setting: everyday and academic thinking. Everyday thinking skills involve routine activities and are automatic. Academic

thinking skills lean toward precise and deliberate evaluation. They believe that when students rely too heavily on everyday thinking skills in academic situations, difficulties and frustrations often result.

To solve the problem, Reeve et al. believe that recognition of its existence as a problem is the first step. After that, a procedure called "reciprocal teaching" was found to be successful in helping students to use the appropriate thinking mode. The teacher takes the lead in demonstrating or modeling the behavior necessary to read material and be able to recall it for purposes of clarifying, interpreting, and predicting. The teacher, as a role model, leads dialogue on a section of reading, usually from the textbook. Gradually, students are guided into a greater and greater role as leader until finally they take over and the teacher becomes available as a sounding board. Reeve et al. found that "reciprocal teaching" opens the door for higher-order thinking by improving comprehension, paraphrasing ability, and summarizing skills.

In today's technologically sophisticated society, knowledge of facts alone is of little value. Reif (1984) is convinced that without reasoning and learning skills, students are inadequately prepared for success. He sees hope for the future with the recent progress in "cognitive science," the field of study which delves into human

information processing and the study of computers which are designed to show human-like intelligence. This investigation has led to a better understanding of human thought processes in the more complex domains which has been helpful in establishing concepts for the teaching of higher-order cognitive skills.

Reif has found that students may have good grades, but still possess gross misconceptions about important academic concepts. He also has found that students may possess a great deal of knowledge but lack the ability or flexibility to use it. They come to the classroom with preexisting conceptions about the world and not with blank minds waiting to be filled. Reif suggests that these preconceived notions are extremely resistant to change and that teachers wishing to teach higher-order thinking must recognize this as a serious obstacle to learning.

Two of the mistakes currently being made by teachers, according to Reif, are in the area of problem solving and the use of qualitative language. In problem solving, too often attention is focused on the solution instead of on the process of solving the problem. Learning of the product may be helpful at the moment but learning of the process will be beneficial in the future when the student may have to solve problems independently. The second mistake occurs when too much stress is placed on quantitative language

with special attention called to precision and formalism. Qualitative language is too often discouraged entirely by teachers when it should be encouraged, with the idea of teaching students how to translate qualitative language into more precise terms when needed.

A study of reading conducted by the Educational Commission of the States (1981) found that students had difficulty in thinking about what they had read. When tested on the ability to defend answers, most of the 100,000 9, 13, and 17-year-old students in the nationwide study were unable to examine, explain, or elaborate on their answers. The results indicated that while students were able to read, they were not able to transfer their reading to higher-order thinking.

Turner and Alexander (1980) believe that teachers need to be good questioners if higher-order thinking is to have a foundation in the classroom. It is their opinion that a single question should never be asked of students unless there are other appropriate questions ready to be introduced that would build on the initial one. They found that the use of games was effective in improving student attitudes about reading. Games that were patterned after television questioning programs were the most popular and successful.

In conclusion, the literature review indicates that people are concerned about what is being taught in the

classroom today. They are concerned about the great amount of facts and information, memorization and regurgitation, and lesson-learners seeking the one right answer. Thinking skills do not just happen; they must be taught directly.

CHAPTER III

ANTICIPATED OUTCOMES AND EVALUATION INSTRUMENTS

Goals

Students must become problem solvers, not data banks full of information that often become outdated. The goal of this practicum is to teach higher-order thinking directly, using the subject of geography as the delivery vehicle. The teaching of thinking skills directly means that some lesson time will be taken from the content area of geography; however, when the benefits are considered, geography will become more meaningful and the thinking skills will be carried over to other academic areas.

Behavior Expected

The study of the literature indicated that the teaching of thinking skills has been a much discussed subject among educators for many years. It presented various arguments for which system or method was the best for teaching the skills and also pointed out one of the biggest problems through the years has been simply deciding on a definition of the term "higher-order thinking."

The thinking skills discussed in this practicum will

be drawn in part from Bloom's taxonomy of educational objectives (Krathwohl, Bloom, & Masia, 1984).

The following are specific objectives for this practicum.

1. During the time period of nine months, students will be able to visualize a topic of study as a whole, develop priorities of important facts and concepts, and summarize the topic. Evaluation will be done by a combination of oral and written, teacher-made tests with success determined by 75% of the students accomplishing the tasks with a minimum of 75% accuracy.
2. During the time period of nine months, students will develop inference skills by becoming proficient in the use of analogies. Evaluation will be done by written, teacher-made tests with success being determined by 75% of the students attaining a score of 75% or higher.
3. During the time period of nine months, students will engage in problem solving using divergent thinking. Evaluation will be done by class discussions, oral reports, and written, teacher-made tests with success being determined if 75% of the students can demonstrate proficiency in the process of divergent thinking.

Evaluation Instruments

Objective One was measured by oral and written, teacher-made tests. The oral test was done from an overhead projector where paragraphs from newspapers were presented for the entire class to experience (see Appendix J). One student at a time was required to deal with the paragraph by prioritizing the important points and by

summarizing the topic. The student was to verbalize his thoughts as he progressed so that the writer could evaluate the product as well as the process. A written test of the same type was administered to the students with a concluding statement required to explain the reasoning behind choices.

Objective Two was measured by written, teacher-made tests (see Appendix K). Students were required to deal with analogies in four ways. The level of difficulty increased with each test, calling upon students to think clearly and discriminate between important and unimportant material.

Objective Three was measured in three ways: class discussion, oral reports, and a written, teacher-made test. Class discussions were designed to solve hypothetical and real problems with "brainstorming" activities (see Appendix L). Records were kept of responses for evidence of divergent thought. Oral reports were given by students in an effort to defend answers and opinions arrived at by divergent thought. Hypothetical and real problems were used with topics similar to those used in discussions. As reports were given, records were kept for evidence of divergent thought. A written test gave students an opportunity to deal with similar topics in a more private and independent manner.

CHAPTER IV

SOLUTION STRATEGY

Discussion and Evaluation of Solutions

Educators are becoming increasingly interested in helping students become conscious of their own mental capabilities and processes. If students are to be properly prepared to engage in higher-order thinking, curriculum planning becomes a vital part of the school program. This planning can be a complicated matter because of the many different approaches that could be used.

One of the problems facing curriculum writers is agreeing on what exactly is meant by metacognitive or higher-order thinking. Duck (1985) believes that there are seven principles that need to be considered for the teaching of thinking skills. One of these is the use of divergent thinking for problem solving. In this type of thinking students formulate answers with a requirement being that they justify or defend their work. Students may feel the need to search for a "right answer" or an answer that the teacher wants. This type of answer would be convergent thought and could lead to game playing by the students to achieve the right answer. It is not as

effective as the process of divergence for the teaching of thinking.

Duck also believes that an important principle for students to understand is how to succeed as learners when exposed to a variety of teaching styles. In United States schools, convergent thinking is the primary style. Students have been looking for the one right answer for as long as they can remember and are very comfortable with closure. Teaching divergent thinking can be as challenging for the teacher as the student.

Testing for higher-order thinking can be a difficult time for students according to another of Duck's principles. For thinking to take place, above the lowest level of recall, tests must contain unfamiliar elements. When students are locked into the right answer syndrome, the idea of such a test can be upsetting. To teach higher-order thinking is also to teach higher-order test taking.

Students demonstrate the highest form of creativity when they engage in divergent thinking. Eulie (1984) believes that a creative person is one who uses his imagination to solve a problem by utilizing existing facts to arrive at a new and useful answer. He feels that creativity should not necessarily be equated with intelligence since tests have shown that individuals with

very high I.Q.s do not always score well in creativity examinations. Eulie feels that in the issue of teaching higher-order thinking skills, students must be provided with opportunities to use their imagination. With the content area of social studies as an example, he would tell teachers to steer clear of presentations that rely heavily on lists of facts to be memorized. Instead, he suggests social studies be taught as a series of open-ended issues and problems with teachers making every effort to encourage student creative thought. Eulie is a proponent of brainstorming activities, "what if" questions to encourage thought about how history would have changed modern day conditions, and examining closely the lives of creative people.

Brainstorming is an idea that Pinkston (1981) believes is essential to developing thinking skills. Initially, some students may feel unsure of themselves and their answers in a brainstorming group. A student who can ask questions, make observations and associations, and predict outcomes is considered to be a valuable member of a group. In order to make every member of a group feel comfortable, teachers need to model appropriate behavior by verbalizing their own thoughts during practice sessions. Pinkston suggests that four rules be used for all brainstorming activities. The first is that criticism not

be allowed during the initial suggestion phase. If this rule is not followed, shy students will be turned off completely and brainstorming will become an exercise for only those who are more outgoing. The second rule is that all ideas will be accepted, no matter how unusual. The third rule to follow is to seek quantity. If there is a great number of ideas in the beginning, there will be a greater chance for quality to emerge during the evaluation phase. The final stage would have group members combining and improving ideas from the earlier stage so that evaluation can take place. Pinkston would remind teachers that while there are advantages to brainstorming such as group participation and accomplishment of a task in a shorter time period, there are also disadvantages. These could be if the overall objective was forgotten and if the members of the group put together their knowledge instead of producing ideas.

Children in the middle grades are undergoing a change from concrete to abstract reasoning. It is during this change that Strahan (1986) believes is the ideal time for teachers to engage in a guided-thinking approach with their students. He is opposed to thinking skills being taught as an enrichment class or with a separate skills curriculum. Strahan sees reasoning development in the middle grades as having eight basic elements of instruction. One in

particular that bears consideration is the encouragement of students to "think aloud" when solving problems during class discussions so that others may learn from different ideas and viewpoints. Another of his elements that helps in the reasoning process is to ask students to share their thinking processes with the class. Strahan also strongly suggests that teachers in middle grades interact intellectually with their students. He sees achievement in abstract thinking only if teachers are willing to be responsive to feedback from students during the instructional period.

Discussion is a term used often in connection with higher-order thinking skills. Hauser (1987) sees a problem when trying to use discussion techniques to develop reasoning ability because of the wall of right or wrong factual information that exists in the minds of students. Not only are students used to the one-right-answer syndrome, but teachers, administrators, and even superintendents are firmly grounded in the same mind set. Hauser suggests that teachers go beyond the short answer response and encourage students to discuss what they do not know. He also recommends taking time to reflect on something said by a student in order to provide a sense of worth. This rewards the student and gives encouragement for others to risk and answer. Hauser would agree with Strahan (1986)

by suggesting that teachers become intellectually involved with student answers. This can be done by sharing a personal state of mind, by inviting students to elaborate, and by asking additional questions. Hauser would warn teachers wanting to use discussion sessions for fostering higher-order thinking to allow suitable wait-time for responses and also to allow enough time after a student's answer in case a classmate wishes to respond.

The skill of problem solving is discussed frequently in connection with higher-order thinking. Davis (1984) believes that an exercise called "futuring" can be a motivating and creative way to teach this skill. She believes that science fiction is a good atmosphere to develop hypothetical problems to be solved because of the natural curiosity of students. Davis also believes that "futuring" is a good way to demonstrate to students the importance of learning to think as opposed to just memorizing facts. Many things that have been learned in school as facts have become modified or even changed completely through the years. Space and medicine are two examples that undergo change on almost a daily basis. Davis sees room for growth in the cognitive as well as affective domain when problem solving in the future deals with subjects such as probable conditions on other planets, graffiti in the year 3000, manners and customs far into

the future, and genetic engineering.

Students seem to be interested in things that are out of the ordinary. Klashy (1977) in an effort to spark interest in geography, and at the same time develop analytical and predictive skills, challenges his students to think of the earth as lacking certain features or phenomena. This concept of reversal or absence moves students from the lowest level of simple recall into higher-order thinking when they deal with ideas such as the earth having no mountains, deserts, or oceans, that the earth has stopped rotating, or that the earth has started to move closer to or away from the sun. Klashy tells of heightened motivation and interest resulting when students on their own ask to read their answers to the class. This brings about discussion sessions which allow for higher-order thinking to continue.

School children from the very beginning are taught convergent thinking. Steffens (1983) explains that the public school system is so steeped in convergence that for a teacher to teach otherwise can mean administrative condemnation and poor classroom evaluations. Graded on control of a group of children, a teacher follows in the mode of "cage-and-control" using teaching techniques that call for "one-right-answers." If a group of learners shows interest in the discovery process, which may cause a

seemingly disruptive atmosphere, a poor evaluation could result. The proof of a convergent philosophy of educational objectives is evidenced when we consider the competency requirements for high school graduation. Steffens sees the microcomputer as a positive force for school systems to add divergent thinking to their objectives. He believes that the computer can give students opportunities for higher-order learning which a regular classroom with its teacher-mandated responses and peer pressure for the "one-right-answer" cannot give. Computers allow for immediate feedback which improves motivation and can eliminate frustration. A computer does not show the emotion of a teacher which Steffens feels is important for building student self-confidence.

Some educators believe that game playing in school is carried on for positive reinforcement or as time fillers with no thought for long range value. To Hipple and Hipple (1983), games that require thinking as their principal objectives can be very useful at all grade levels and in all content areas. In addition to enhancing thinking skills, games can promote socialization when students interact with each other to solve puzzles in a cooperative effort. Listening skills are strengthened when students have to pay attention to those speaking or leading the game. Hipple and Hipple remind us that just plain having

fun while playing thinking games is also a worthwhile objective.

To be an effective writer, a student must be able to visualize a topic as a whole and arrive at conclusions based on valid thought. Pooler and Perry (1985) suggest that writing can help to develop higher-order thinking by requiring students to analyze, synthesize, and evaluate material before they begin to write. They must recall from memory certain information in order to present it in a clear and concise manner. Pooler and Perry believe that being able to sequence items or events isn't just remembering the correct order, which some consider to be the lowest level of thinking. They feel that higher thought is required in how to best express and connect the facts. Students need to make decisions about items of more or less importance as they organize their writing.

In any discussion of critical thinking skills the role of creativity is sure to surface. Just as with the concept of direct teaching of thinking skills, Perkins (1984) believes that schools can promote creative thinking by focusing on certain important points. Two things that he would say should not be considered about creativity are that it is a single ability or that it is a talent. Perkins looks at creativity in terms of output. He is not ready to agree that one single factor can explain a

creative person or what they produce. He finds fault with the public school system when there is not enough time allowed in the classroom for creative thought and when teaching is geared to the "one-right-answer." Students pick up on the mechanical attitude of teachers when they pass on knowledge as a given instead of products of creative effort. Perkins believes that creativity can be taught by design. He would have students consider knowledge in light of these four questions: What is its purpose?; What is its structure?; What are some model cases?; What are some arguments for or against the design?. He would also encourage students not to fear failure. It must be considered part of the creative process.

King and Glynn (1986) believe that one of the best ways to develop inference skills and at the same time improve reading comprehension is to teach students how to use analogies. They suggest that when analogies are used as a way of solving problems students will use the structure of one solution to help solve another problem. Analogies help to distinguish between relevant and irrelevant information indicating student ability to reason. When a strategy for solving analogies is developed, there can be a transfer of ideas from a known to an unknown topic.

Problem solving is an analytical skill that Whimby and Lockhead (1983) believe can be difficult to teach

because most thinking is done in secret. To reduce the difficulty, the teacher needs to model his behavior by thinking aloud as he solves the problem. If students vocalize their thoughts as they attempt to think through a problem, teachers can better assist with remedying inaccuracies and weaknesses. There is also a much greater chance for learning to take place by those listening to another's thought processes. Whimby and Lockhead suggest that teachers use a set procedure or plan as they speak aloud so that students can develop meaningful thinking habits and attack problems in an organized manner.

Students feel very comfortable when they have achieved closure on an activity, mainly because of the convergent teaching methods that have surrounded them since grade one. Handelsman (1984) would have teachers continue the process of gathering knowledge with their students, but would add activities which would encourage them to grapple with the material they have learned. Activities that allow students to predict will help bridge the gap between concrete and abstract thought. He believes that people are motivated naturally to anticipate events and that teachers should build on that concept to teach higher-order thinking skills.

A comfortable, nonthreatening classroom atmosphere is essential for the learning of thinking skills.

Marsh (1978) believes that unless students feel completely at ease when making comments reflecting personal ideas and opinions, there will be little accomplishment. One particular area of higher-order thinking that needs a supportive, trusting environment is the inquiry approach to learning. It is the reflective nature of inquiry, where students become willing to expose their beliefs and feelings, that calls for openness. Marsh reminds teachers who use the inquiry approach that they must be willing to continually reexamine their own assumptions, values, and attitudes as they interact with students.

In summary, the literature review showed a number of worthwhile ideas for developing higher-order thought processes. While the sources may have had different approaches to the solution, they all agreed that a serious problem does exist and that a major stumbling block is educational tradition.

The solution selected by the writer for this practicum incorporates ideas from several sources since no single concept found in the literature was appropriate.

Description and Justification for Solution Selected

The solution to the problem that middle school students are not being taught higher-order thinking skills needs

to be considered from two viewpoints. One is that traditional teaching methods which stress convergent thinking need to be changed. The second is that thinking skills need to be taught directly before they are applied to the content areas.

Middle school students need and look for some type of structure in their school environment even though they may be heard to complain about too much organization. This project gave structure to the task of teaching a selected group of higher-order thinking skills to grade seven geography students by the use of a standard syllabus (see Appendix M). The syllabus was distributed at the beginning of each new unit of geography so that students had input in organizing the work to be done. One class period was set aside as a discussion session to arrive at class agreement on key facts and vocabulary words to be learned. Small groups met first and then a general discussion of the class was called to make final decisions. The writer summarized the results of all classes and presented the findings the following day. The students were reminded that, while recall of information is important, it represents the lowest level of thinking. Quizzes were administered to ascertain mastery of the basic information.

The part of the project where higher-order thinking

skills were taught directly is outlined in part IV of the syllabus (see Appendix M). As a unit of study was covered, a minimum of one full class period was given over to the teaching of each of these three thinking skills. It is the opinion of the writer that for these skills to be understood, they must be taught directly without initial reference to the content area.

Visualizing a topic as a whole, developing priorities of important facts and concepts, and summarizing was the first skill to be taught directly. An overhead projector was used in presenting paragraphs, taken from the local newspaper, for study in which the writer thought aloud the procedure for skimming and prioritizing, all the while seated in a student desk as though a class member. Students have a tendency to give more attention to the screen when the teacher is seated, facing as they are. Additional paragraphs were used with selected students thinking through their thoughts aloud, so that others could learn from different viewpoints. The class session then moved to a worksheet, presenting a paragraph similar to those used earlier except students followed the procedure for dealing with a topic by writing their thoughts.

The second thinking skill to be taught directly was inferencing which was accomplished by studying analogies. Once mastered, this skill allowed students to think

logically and clearly and to decide the difference between relevant and irrelevant material. An overhead projector was used initially showing analogies in various stages of incompleteness. The writer thought aloud as solutions were devised and students were taught the importance of relationships in understanding analogies. A strategy was suggested to think first about the known parts of the example before inferring a relationship. Selected students were asked to think through their reasons aloud so that others would benefit.

The third higher-order skill to be taught was divergent thinking. This task involved brainstorming for solutions to problems which lead students away from the convergent "one-right-answer" idea. Once again the writer demonstrated his own thought processes by considering a problem aloud. Three basic ground rules were established before the class brainstorming sessions began: criticism was not allowed during the thinking stage, ideas were heard no matter how unusual, ideas had to have a factual base.

After each thinking skill was taught directly, a review was planned for the following day(s) using geographic concepts from the current area of study. Topics were organized and summarized, inferences were made through analogies, and problems were solved using brainstorming

and divergent thinking.

The special activities section of the syllabus outline was used to extend higher-order thinking to a variety of high-interest assignments. Some of these included using divergent thinking to predict future world environmental problems, solving unrest in politically unstable regions, or predicting a political event after an international incident.

The final activity on the syllabus gave students the opportunity to invent a game to be played in class using the current unit of study as the basis for factual information. This was done by committee in order to encourage brainstorming and cooperation.

Report of Action Taken

The students taking part in the project were members of the writer's grade seven advanced geography classes. This included four classes with a total of 99 students from the 1988-89 school year and three classes totaling 98 students from 1989-90. The class distinction "advanced" is based upon teacher recommendation from the previous year and Stanford Achievement Test stanine scores. All project procedures were carried out in the same manner with both groups of students. The only difference was

that the 1988-89 group began during the second half of their grade seven year while the 1989-90 students became involved with the project at the beginning of their school year.

An introductory period was carried out to familiarize students with project procedures. A syllabus was used as the basis for organization and was discussed in detail (see Appendix M). It was pointed out to the students that the objectives of the project dealt with improving their higher-order thinking skills. It was also explained that they would be taking an active role as each unit of study was developed through the syllabus, by giving input in parts II, III, and IV. There were discussion sessions in which students suggested important facts and vocabulary to be used in lessons. They also decided which concepts should appear on tests and quizzes. It was the writer's concern that, given the opportunity, the students might opt for simple words or facts that could be easily learned for tests instead of concepts with geographic substance. It proved to be an unnecessary concern, because it was found that when given control, the students made sound suggestions.

At the conclusion of each unit a committee of three to five students in each class were responsible for presenting a game based on the unit. The interest and

enthusiasm was evident as each new syllabus was developed with student input.

Part IV-A of the syllabus was the first main thrust dealing specifically with the practicum objectives of thinking skills (see Appendix M). As each new unit was covered, the skills were taught directly and then applied to the content area. A letter was sent to parents explaining the fact that teaching thinking skills directly would take time away from geography (see Appendix N). Response received was overwhelmingly positive except for one parent who was fearful that higher-order thinking was some type of new-age philosophy involving meditation.

Topic organization was taught by reproducing newspaper stories on overhead transparencies. This particular activity had three main parts. First, the writer responded to the news article as the transparency was displayed for about seven seconds, verbalizing his thoughts as the class observed and listened. A brief discussion with summarizing took place before the same transparency was shown for a second and longer time. More discussion followed dealing with the best organization of key facts and ideas.

The second step was similar to the first except that during the seven-second observation, the entire class silently organized their thoughts. A brief discussion

was followed by a second viewing and summation.

The final step involved individual students viewing other news articles, first briefly, thinking aloud as they experienced important points, with discussions following.

The writer kept special evaluation notes on the progress as each student dealt with the articles. This policy was helpful in allowing equitable time during discussions.

Following the steps of the syllabus, the skill of organizing a topic became focused on the content area. The same procedure was followed: brief exposure to material, organize important points, discussion, take a second and longer look at the material for summary purposes. The textbook and other selected materials were used instead of transparencies for this part.

It has been the writer's experience that when middle school students are given a reading assignment they often begin at the beginning and read all the way through, word-for-word to the end. While some assignments may call for careful scrutiny of facts, most do not. The system of using a few brief seconds to scan material forced the students to search for key facts and organize them quickly. The quick-scan approach seemed to make the second time through the reading more meaningful for understanding

and retention. As part of the project, a homework practice sheet was used based on newspaper articles (see Appendix O). This became a popular exercise with many volunteers ready to present their work.

Evaluation was done by keeping record of the oral progress made by students as they worked individually (see Appendix P). A worksheet was used as a second form of evaluation (see Appendix Q). These two procedures were carried out during the implementation of the project and the scores averaged at the conclusion for a determination of success.

The next section to deal directly with higher-order thinking skills was part IV-C of the syllabus, inferences. This was accomplished by the use of analogies. The overhead projector was used once again to display examples used for the oral part of the lesson (see Appendix R). The writer began by verbalizing his own thoughts on various analogies to serve as examples. Discussion always followed in which students were encouraged to give their own ideas about how they infer answers. Selected students would then verbalize their own logic as additional analogies were solved with progress noted on a special grading chart (see Appendix S). A worksheet was given as an exercise for independent work. Students then applied their knowledge of inferencing to the content area by devising

their own analogies about the current unit of study. This allowed for further reinforcement of their skills.

Analogy problems are found on standardized tests beginning at the earliest grades. Reasoning powers are tested by measuring the ability of students to see relationships and then apply them to other areas.

The final higher-order thinking skill to be treated in this project was divergent thinking (Syllabus IV-E). The idea that there can be more than one right answer to a problem was unfamiliar to many students who, through the years, had been exposed to more traditional, convergent thinking.

Divergent thinking was first taught directly by brainstorming various topics unrelated to geography. Before each session two basic rules were reviewed: no criticism permitted and all ideas given equal time. The same rules were in use when divergent thinking was applied to units of geography being studied. The topics for geographic brainstorming were often real problems which may have had news media exposure (see Appendix T). Evaluation was done by the keeping of records of individual student effort during class discussions and oral presentations. Written tests were of the essay type (see Appendix U).

Chapter V

RESULTS, CONCLUSIONS, AND RECOMMENDATIONS

Results

Oral and written tests were used to measure Objective One. A record was kept on each student to note progress in the oral response section (see Appendix P). As noted earlier in the practicum, there were two groups involved due to the implementation taking place over a span of two school years.

The first group (99 students) experienced a practice lesson and three regular lessons in organizing and summarizing. There was a definite improvement in student ability to scan a body of information, develop priorities, and summarize as shown in Table One (see p. 49). The writer predicted a success rate of 75% for Objective One. If all three lessons are considered, 58% of the students fell into either the satisfactory or excellent category. When just the last lesson is considered, however, there is an 71% success rate.

Table Two (see p. 49) shows similar progress for Group Two (98 students) even though there were two differences. Group One became involved with the project during the last third of their grade seven year and experienced three

Table One. Results of Oral Response, Organizing a Topic

Group One (N=99)

	Improvement Needed	Satisfactory	Excellent	Success %
Practice	67	23	9	32%
Lesson 1	57	[30	12]	42%
Lesson 2	37	[44	18]	62%
Lesson 3	28	[49	22]	71%

Table Two. Results of Oral Response, Organizing a Topic

Group Two (N= 98)

	Improvement Needed	Satisfactory	Excellent	Success %
Practice	72	21	5	26%
Lesson 1	63	[25	10]	35%
Lesson 2	51	[37	10]	47%
Lesson 3	32	[52	14]	67%
Lesson 4	26	[52	20]	73%
Lesson 5	24	[41	33]	75%
Lesson 6	19	[37	42]	80%
Lesson 7	17	[35	46]	82%

lessons, while Group Two began their work at the beginning of the school year and had seven lessons. The total success rate for Group Two was 65% with a final lesson reaching 82%. The combined success rate for both groups was 76.5%.

The written evaluation of Objective One was carried out through the use of worksheets used with each lesson (see Appendix Q). The final success rate was established by the use of a special test given at the conclusion of the project (see Appendix V). A format similar to the one used with the overhead projector had the following steps: news article printed on one side of paper; evaluation form printed on the reverse side; quick look at the article for key facts (seven seconds); turn paper over; list key facts and make a brief summary; look at the article for a longer time; write final summary.

The writer considered 75% accuracy to be if the students could list at least three key facts and could write a brief summary which included a minimum of who, what, and where about the article. Many students developed their abilities, during the project, to scan five or more important facts and to summarize using all five of the familiar "W's" plus "how" on a consistent basis. The enthusiasm carried over to the home when some students reported challenging Mom or Dad to scan newspaper articles for facts. The results of this final exercise are shown

Table Three. Results of Written Response, Organizing a Topic

	Group One (N=99)	Group Two (N=98)	
	# Students achieving at least minimum	Success %	Combined Success %
Group One	72	72.7%	
Group Two	80	81.6%	<u>77%</u>

in Table Three.

The results of both the oral and written evaluations showed a higher achievement rate for Group Two. This was probably due to the fact that Group Two was exposed to the project for a longer period of time.

Objective Two was measured by using teacher-made tests on analogies during the implementation of the project. A more comprehensive test was used as a final evaluation to determine the success rate. A variety of the most common analogy relationships were used on this test some of which included: synonyms, antonyms, association, cause-and-effect, effect-and-cause, characteristic, part-to-whole and whole-to-part, part-to-part (see Appendix W).

The test was open-ended with students required to fill in the missing analogy parts. They were also required to briefly write reasons for their choices.

Group One achieved a 69% success rate, below the anticipated 75% score for the second objective. Group Two fared better with 78% success, giving a combined average of 73.5% as shown in Table Four. Once again the differences in scores can probably be attributed to the length of time each group was exposed to the project.

The reasons given for answers were put into three categories: acceptable, unacceptable, and guesswork. The same minimum 75% score was used for comparison purposes which is also shown in the table. An acceptable answer needed to first demonstrate understanding of the given relationship and then proceed to explain the choices. Students had a tendency to rely on guesswork or the reason "it sounds right."

Table Four. Results of the Analogy Test

	Group One (N=99)	Group Two (N=98)	
	# Students achieving at least minimum	(Acceptable reasons)	Success % Combined Success %
Group One	68	(59)	69%
Group Two	76	(64)	78%
			<u>73.5%</u>

Evaluation of the final objective was carried out during the entire project implementation period. A seating chart was used to keep records of student progress during the lessons when divergent thought processes were taught and encouraged through brainstorming and problem solving. By keeping tally marks, the writer was able to note which students actively engaged in brainstorming and which had to be prodded into action. As a final evaluation for divergent thought, an essay test was given using a selection of realistic problems to be solved through an independent brainstorming process (see Appendix X). The problems ranged from the political such as arriving at a fair and equitable solution to the Falkland Islands controversy to geographic such as how should coastal South Florida cope with a predicted rise in sea level.

The writer considered divergent thinking to be taking place if students demonstrated the ability to anticipate certain results taking place if their solutions were put into effect. Whether a solution seemed bizarre or entirely impossible was not the issue in grading. A thinking process had to be evident.

The results did not reach the anticipated 75% as seen in Table Five (see p. 54). The pattern of Group Two being higher than Group One was evident again; however, the numbers were much closer than in the earlier evaluations.

In brainstorming, every answer is a good one if some thought went into it. Even though about a third of the students did not demonstrate the process required by the writer, credit was given for the efforts put forth.

Table Five. Divergent Thought Process

	Group One (N=99)	Group Two (N=98)	
	# Students	Success %	Combined Success %
Group One (4 lessons)	66	66.6%	
Group Two (7 lessons)	68	69.3%	<u>67.9%</u>

In conclusion, the writer considered the concept of teaching thinking skills directly to be of value especially when there followed immediate application to the content area of geography. The students displayed enthusiasm and interest in the thinking skills lessons and quickly caught on to the idea that there doesn't always have to be "one right answer." The results of an opinion survey seemed to indicate positive feelings about the project (see Appendix Y).

Teaching thinking skills directly as a skill helped to improve student self-concept. Those who normally hang

back and are afraid to speak up for fear of criticism, had opportunities to come up with ideas that were recognized as valuable. Use of the syllabus which called for student input and the brainstorming activities allowed for students, considering themselves to less intelligent than others, to come forward and be recognized.

Conclusions

The first objective met the anticipated 75% success rate if the percentage from the last lesson is used and if Group One and Group Two are averaged together. The length of exposure seemed to make a difference in the outcome. Group One had three lessons while Group Two had seven. The difference in scores was also true on the second part of Objective One when students were required to write summaries.

Objective Two followed a pattern, similar to Objective One. However, when the two groups were considered together, the average fell below the anticipated 75%. A reason may be that students did not take enough time to think through the given relationship. The reasons "it sounds right" and "I guessed" were often used. Another reason may be in the choice of vocabulary for the analogies. If some words were unfamiliar or misunderstood, students would resort

to guessing.

King and Glynn (1986) suggest that students will develop their own strategies for solving analogies. That seemed to be true with many students, especially those in Group Two, perhaps because of the additional lesson exposure. Encouraging students to think aloud as they reason through analogies was difficult. When it did happen and the reasoning was appropriate, the writer was able to give immediate reinforcement and the rest of the class was able to profit from new ideas. It is the opinion of King and Glynn that when students learn to deal with analogies, their reading comprehension improves and they show more precision in analyzing. Even though the total percentage of success may not have reached or surpassed the anticipated 75%, the writer observed many individual students making excellent progress as analogy skills were applied to organizing and summarizing.

Objective Three had the poorest results (67.9%). Perhaps the writer did not make the problems to be solved specific enough as suggested by Pinkston (1981). While the percentage was the lowest, the enthusiasm and interest was the highest of the three objectives. When the time came to share ideas that had been written, hands were raised and no encouragement was needed.

In conclusion, this project demonstrated to the writer

that teaching thinking skills directly by taking time from a regular class can be very beneficial in improving the reasoning ability of students. The direct application of skills to the content area seemed like a natural step. Geography was made more meaningful, and student self-esteem was improved.

Recommendations

The writer makes the following recommendations. First, that higher-order thinking skills should be taught directly in each of the four major discipline areas of math, science, English, and social studies. If the teachers are agreeable, skills should be divided, so that no one academic class would unduly suffer with lost content time. The interdisciplinary-team teaching approach used in many contemporary middle schools would lend itself nicely to organizing a thinking skills curriculum.

A second recommendation would be to seek parental support for the project. This could be done through parent-teacher meetings and correspondence. It is doubtful that parents would object to class time being given over to the teaching of thinking skills.

Finally, the students need to be made aware of the difference between gathering information to receive a grade

and therefore being considered intelligent and learning how to think for thinking's sake. The "one right answer" idea that has so long been the major thrust of education has to be modified.

The writer enjoyed implementing this project and was pleased with the results that came from it. The students grew in their higher-order thinking skills and in their study of geography.

Dissemination

This completed practicum was shared with the social studies department in the writer's school center and a copy was placed in the professional library. An offer was made to be of individual assistance to any teacher interested in a similar project.

A copy was submitted to the social studies specialist of the school district with the same offer of assistance to any interested teachers in the district.

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APPENDIX A
A SURVEY FOR PRACTICUM II

A SURVEY FOR PRACTICUM II

"THINKING SKILLS"

1. Do you feel that there is an adequate amount of class time given over to the teaching of thinking skills during the middle school years (e.g. applications, analyses, classifying, synthesizing, evaluating, problem solving, interpreting, generalizing)?

adequate

less than adequate

2. Does the textbook that you are currently using deal with thinking skills on a regular basis?

yes

no

3. If yes to number two above, does the teacher's edition for your textbook adequately assist you in the preparation of thinking skills lessons?

yes

no

4. Some of the school district's Unified Curriculum objectives use such words as "interpret", "define", "discriminate", "analyze", "differentiate", "compare and contrast", "support". Do you feel that students would benefit from "how to" instruction in these areas before applying them to the content areas?

yes

no

no opinion

5. In your opinion, does the district's Unified Curriculum teacher's guide for your subject area adequately assist you in the teaching of thinking skills?

yes

no

APPENDIX B
RESULTS OF SURVEY FOR PRACTICUM II

RESULTS OF
A SURVEY FOR PRACTICUM II

"THINKING SKILLS"

(8 Social Studies Teachers Responded)

1.	<u>adequate</u>	<u>less than adequate</u>
	0	8
2.	<u>yes</u>	<u>no</u>
	4	4
3.	<u>yes</u>	<u>no</u>
	2	2
4.	<u>yes</u>	<u>no</u>
	7	1
5.	<u>yes</u>	<u>no</u>
	0	8

APPENDIX C
TEST YOUR THINKING SKILLS

TEST YOUR THINKING SKILLS
Selected from Whimby Analytical Skills Inventory
(by permission)

1. Which word is different from the other three words?
a. yell b. talk c. pencil d. whisper
2. Which letter is as far away from "K" in the alphabet as "J" is from "G"?
a. K b. M c. N d. G e. I
3. If you are facing east and turn left, then make an about-face and turn left again, in which direction are you facing?
a. east b. north c. west d. south e. southwest

* * * * * * * * * * *

Answer the following questions and briefly explain how you arrived at your answer. (write on reverse side)

1. Which pair of words fits best in the blanks?
Arm is to wrist as _____ is to _____.
a. leg: foot b. thigh: ankle c. leg: ankle d. leg: knee
2. Which set of letters is different from the other three sets?
a. EFGE b. BCDB c. KLML d. OPQO
3. In a different language liro cas means "red tomato", dum cas dan means "big red barn", and xer dan means "big horse". What is the word for "barn" in this language?
a. dum b. liro c. cas d. dan e. xer
4. There are 3 separate, equal-sized boxes, and inside each box there are 2 separate small boxes, and inside each of the small boxes there are 4 even smaller boxes. How many boxes are there all together?
a. 24 b. 13 c. 21 d. 33 e. some other number
5. A journey always involves a _____.
a. person b. destination c. distance
d. vehicle e. preparation

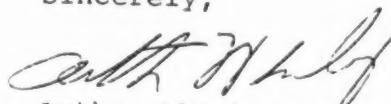
APPENDIX D
WHIMBY PERMISSION LETTER

February 3, 1989

To Whom It May Concern:

I hereby grant permission for Richard D. Freseman to use selected questions from the WHIMBEY ANALYTICAL SKILLS INVENTORY (WASI). The test items may be used in a classroom setting as well as in a Practicum report presented to NOVA University entitled: "Improving Higher-Order Thinking of Middle School Geography Students by Teaching Skills Directly."

Sincerely,


Arthur Whimbey

Arthur Whimbey
290 Sunrise Drive (3-L)
Key Biscayne, Florida 33149

Richard,
Good luck with your work
RT 78

APPENDIX E
RESULTS OF THINKING SKILLS TEST

RESULTS OF THINKING SKILLS TEST

(99 Students)

Question	Guesswork Answers	Logical Thinking Answers	Correct Responses
1.	18	81	69
2.	17	82	79
3.	43	56	28
4.	51	48	22
5.	53	46	24

Logical thought did not always produce the correct response.

APPENDIX F
THINKING SKILLS EXERCISE

1. Contrast the climates of the United States.

I understand the wording of this sentence. _____

If no, of which word or words are you unsure?

2. Analyze the findings of Jacques Cousteau's investigation of the Great Salt Lake.

I understand the wording of this sentence. _____

If no, of which word or words are you unsure?

3. Interpret the results of a recent report on the "greenhouse effect".

I understand the wording of this sentence. _____

If no, of which word or words are you unsure?

4. Sequence the events leading to the Mt. Saint Helen's eruption.

I understand the wording of this sentence. _____

If no, of which word or words are you unsure?

5. Summarize a newspaper article about the increasing loss of the ozone layer.

I understand the wording of this sentence. _____

If no, of what word or words are you unsure?

APPENDIX G
RESULTS OF THINKING SKILLS EXERCISE

RESULTS OF THINKING SKILLS EXERCISE

99 students questioned

command word	understood sentence	unsure of command word	unsure of other words	total
1. Contrast...	51	48	0	99
2. Analyze...	80	19	0	99
3. Interpret...	64	33	2	99
4. Sequence...	97	1	1	99
5. Summarize...	95	3	1	99

APPENDIX H

WORD STUDY

WORD STUDY

1. CONTRAST: A) similarity B) in agreement C) contribute
D) show the difference
2. ANALYZE: A) examine in detail B) bring together
C) read about D) opposite things
3. INTERPRET: A) to look at B) explain C) write about
D) to keep secret
4. SEQUENCE: A) to take notes B) talk about
C) explain cause D) put in order
5. SUMMARIZE: A) to give all details B) write a report
C) to take apart D) to outline

APPENDIX I
RESULTS OF WORD STUDY

RESULTS OF WORD STUDY

99 students questioned

word	correct response	other responses			total
1. CONTRAST:	D) 80	A) 14	B) 0	C) 5	99
2. ANALYZE:	A) 93	B) 5	C) 1	D) 0	99
3. INTERPRET:	B) 87	A) 8	C) 3	D) 1	99
4. SEQUENCE:	D) 99	A) 0	B) 0	C) 0	99
5. SUMMARIZE:	D) 72	A) 15	B) 7	C) 5	99

APPENDIX J
SAMPLE TEST, OBJECTIVE ONE

SAMPLE TEST
(Objective One)

Directions: Read, develop priorities, summarize

SAN DIEGO, CALIFORNIA:* A teen-ager can thank a pair of dolphins for saving his life Saturday when they chased away a shark that began attacking him and his surfboard.

John Clarke received numerous wounds requiring a total of 217 stitches and is recovering in St. Paul's hospital in suburban San Diego.

The shark, estimated to be 14 feet long, took an 18 inch bite out of Clarke's surfboard in addition to severely biting the boy on the legs.

The dolphins suddenly appeared and began thrashing in the water as if to chase off the shark. They swam in circles around Clarke until rescuers came close and then the pair disappeared.

* (hypothetical newspaper article)

APPENDIX K
SAMPLE TEST, OBJECTIVE TWO

SAMPLE TEST

(Objective Two)

Directions: Supply the correct answers and explain the relationships of the following.

1. duck is to duckling as doe is to _____
2. mother is to father as aunt is to _____
3. airplane is to air as boat is to _____

4. corn : vegetable :: banana : _____
5. boy : girl :: masculine : _____
6. world series : baseball :: super bowl : _____

7. cow : calf :: _____ : _____
8. eyes : seeing :: _____ : _____
9. football : goalpost :: _____ : _____

10. _____ is to hand as socks are to _____
11. _____ is to night as noise is to _____
12. _____ is to reptile as goat is to _____

APPENDIX L
SAMPLE BRAINSTORMING LIST

SAMPLE BRAINSTORMING LIST

(Objective Three)

Junk foods: What? Why? Is there a better term?

What is the best way to have a balloon race?

From where did the term "baby sitter" come?

For what other things can a paper clip be used?

What is a *Conus spurius atlanticus*?

How can you train a penguin to fly?

What could be done to keep leaves from falling from trees in the winter.

How did the word "quick" come to be mean "alive" and not "dead"?

Why is a "sloppy Joe" not called "Bill" or "Jim"?

Is it better to push or pull a two-way door when passing through?

APPENDIX M
GEOGRAPHY SYLLABUS

GEOGRAPHY SYLLABUS

- I. General Area to be Studied: _____
- II.* Key Facts for Memory:
- III.* Key Vocabulary for Memory:
- IV. Thinking Skills
 - A. Organizing a topic
 - 1. Important ideas
 - 2. Summarize
 - B. Apply "A" to content area
 - C. Inferences
 - D. Apply "C" to content area
 - E. Divergent Thinking
 - 1. Brainstorming
 - 2. Problem solving
 - F. Apply "E" to content area
- V. Special Activities
- VI.* Game

(* developed with student input)

APPENDIX N
PARENT LETTER

Dear Parents:

I wish by this letter to inform you of something new in your son/daughter's geography program. In addition to the regular lessons involving the study of world geography, several higher-order thinking skills will be taught directly. Briefly, these skills deal with: being able to visualize a topic as a whole, develop priorities of important concepts, and summary techniques; the use of analogies to strengthen the skill of making inferences; problem solving using divergent thinking instead of the more traditional "one right answer" idea of convergent thought.

Teaching thinking directly simply means that deliberate attention will be given to certain thinking skills. This will take some lesson time away from geography, but when the benefits are considered, the study of geography will become much more meaningful and the skills will be carried over to all academic areas.

If you have any questions, please do not hesitate to contact me by phone at _____ or by sending a note with your student.

Sincerely,

Richard D. Freseman

APPENDIX O
HOMEWORK PRACTICE

HOMEWORK PRACTICE

- Directions:
1. Locate a news article of interest.
 2. Scan for key facts.
 3. List facts on lines below.
 4. Write a brief summary.
 5. Remove article from newspaper and fasten to reverse side of worksheet.
 6. Be prepared, if called upon, to present to class using the overhead projector.

* * * * *

HEADLINE:

KEY FACTS:

SUMMARY:

APPENDIX P
ORAL RESPONSE LOG

ORAL RESPONSE LOG

(Organizing a Topic)

1 = improvement needed 2 = satisfactory 3 = excellent

[illegible]

APPENDIX Q
WORKSHEET: ORGANIZING A TOPIC

WORKSHEET: ORGANIZING A TOPIC

HEADLINE: _____

KEY FACTS (Quick Scan): _____

BRIEF SUMMARY (One Sentence): _____

+ + + + + + + + + + + + + + + +

A CLOSER LOOK

FINAL SUMMARY: _____

APPENDIX R
ANALOGIES FOR DISCUSSION

ANALOGIES FOR DISCUSSION

1. ONE is to TWO as THREE is to
A) five
B) six
C) ten
D) twenty
2. WEEK is to MONTH as SEASON is to
A) spring
B) year
C) hour
D) harvest
3. MOTHER is to DAUGHTER as FATHER is to
A) aunt
B) uncle
C) son
D) brother
4. HEAT is to FURNACE as LIGHT is to
A) electricity
B) star
C) sun
D) lamp
5. SNAKE is to REPTILE as WHALE is to
A) water
B) huge
C) animal
D) mammal
6. GIGANTIC is to HUGE as MUDDY is to
A) unclear
B) spotless
C) rough
D) smooth
7. FINGER is to HAND as ISLAND is to
A) continent
B) archipelago
C) sea
D) peninsula
8. MOON is to EARTH as EARTH is to
A) Saturn
B) sky
C) Moon
D) Sun
9. FUTURE is to PAST as TOMORROW is to
A) present
B) yesterday
C) unknown
D) future

APPENDIX S
ANALOGY GRADING CHART

APPENDIX T
BRAINSTORMING TOPICS

BRAINSTORMING TOPICS

1. How could Canada make better use of its cold, northern territories?
2. What can Canada and the United States do jointly to solve the acid rain problem in North America?
3. What would be the best way for Mexico to make use of its dry central region?
4. What could countries with shipping interests, such as the United States, do if the Panama Canal was no longer available for transit?
5. What can be done to encourage Brazil to stop the large scale burning of rain forests?
6. How should the problem of ownership of Antarctica be resolved?
7. What would be the fairest way to bring about land reform in some South American countries?
8. What would be a fair solution to the problem in Northern Ireland?
9. What would be the best way to avoid any more oil spills such as the one in Prince William Sound, Alaska?

APPENDIX U
WRITTEN TEST FOR BRAINSTORMING

WRITTEN TEST FOR BRAINSTORMING

103

PROBLEM: _____

SOLUTION: _____

POSITIVES

NEGATIVES

| | |
|-------|-------|
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

WHAT WOULD HAPPEN IF THE PROBLEM WAS LEFT UNANSWERED?

WHAT WOULD HAPPEN IF MY SOLUTION WAS USED?

APPENDIX V
WRITTEN EVALUATION OBJECTIVE ONE

WRITTEN EVALUATION, OBJECTIVE ONE**"Shoreline is Eroding Three Feet a Year"**

TALLAHASSEE - The millions of people expected to move to Florida this decade will be descending on a state that is slowly disappearing into the sea, according to a Florida State University researcher.

"It has been known that Florida beaches are eroding, but not to this scale," said Dr. Suleyman Demirpolat, a coastal geologist at the university's Florida Resources and Environmental Analysis Center.

By studying maps dating back to the mid-1850s, Demirpolat and geology Professor William Tanner have discovered that the state's shore is eroding at an average of three feet a year - much faster than previously thought.

The high-precision computer- mapping project, which began four years ago, was contracted by the Florida Department of Natural Resources.

"The main purpose of this project is to find out what is happening to Florida's shorelines," Demirpolat said. A secondary purpose, he said, is to draw accurate coastal construction lines. The control lines, which are enforced by the DNR, mark the boundary where building is restricted.

The most severe erosion is at Cape San Blas in the Panhandle, which has been losing ground at a rate of 27 feet per year since 1868.

"The lighthouse at Cape San Blas has been replaced four or five times in the last 100 years," Demirpolat said.

Other areas that are undergoing severe erosion are Key Biscayne and Palm Beach, Demirpolat said.

Demirpolat said Palm Beach County's most vulnerable areas are south of the Jupiter Inlet, where tidal changes tend to have the most impact, and Lake Worth beach.

But Demirpolat said Palm Beach county's worst erosion can't compete with the bad damage in the Panhandle and near Marco Island, where erosion rates average more than 14 feet a year.

(PALM BEACH POST, FEBRUARY 6, 1990)

EVALUATION FORMAT

Key Facts (Quick Scan): _____

Brief Summary: _____

Final Summary: _____

APPENDIX W
ANALOGY TEST

ANALOGY TEST

1. Fill in the blanks with words of your choice.
2. Be sure to consider the relationship of the known before attempting the unknown.
3. Briefly, explain your reasoning.

1. up : down :: left : _____

2. free : release :: praise : _____

3. team : league :: player : _____

4. fish : fin :: wing : _____

5. book : library :: painting : _____

6. March : August :: carrot : _____

7. washer : dryer :: reward : _____

8. arm : leg :: chair : _____

9. injury : pain :: war : _____

10. noise : firecracker :: tundra : _____

11. silly : sensible :: _____ : _____

12. turn : wheel :: _____ : _____

13. bottom : base :: _____ : _____

14. North : South :: _____ : _____

15. Cow : butter :: _____ : _____

APPENDIX X
DIVERGENT THOUGHT PROCESS

DIVERGENT THOUGHT PROCESS

PROBLEM: _____

TWO POSSIBLE SOLUTIONS:

- | | |
|----------|----------|
| 1. _____ | 2. _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |
| _____ | _____ |

I PREFER SOLUTION ____

WHY? _____

APPENDIX Y
RESULTS OF PROJECT SURVEY

PROJECT SURVEY

(N=197)

yes no unsure

| | | | |
|----------|----------|---------|---|
| 0
114 | 0
63 | 0
20 | 1. Do you believe that the geographic syllabus was helpful in keeping lessons organized? |
| 0
120 | 0
71 | 0
6 | 2. Did helping to decide on the key facts and vocabulary make the lessons more interesting? |
| 0
109 | 0
47 | 0
41 | 3. Do you believe that learning how to organize a topic by scanning for important facts is a valuable skill to learn? |
| 0
135 | 0
45 | 0
17 | 4. Do you believe that using analogies for practice before applying them to geography lessons is helpful? |
| 0
115 | 0
41 | 0
41 | 5. Was brainstorming about topics that were unrelated to geography a good idea? |
| 0
102 | 0
63 | 0
32 | 6. Did you feel nervous about talking in front of the class in the beginning? |
| 0
75 | 0
102 | 0
20 | 7. Did you feel less nervous near the end of the project? |
| 0
43 | 0
134 | 0
20 | 8. Do you like to make oral reports in front of the class? |
| 0
94 | 0
97 | 0
6 | 9. Did you ever discuss the thinking skills with your parents? |
| 0
104 | 0
70 | 0
23 | 10. Did the thinking skills learned in geography class ever help you in other classes? |